Potential of manure injection to increase N and P use efficiencies in maize

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In northwestern Germany, broadcast application of liquid manure usually covers nutrient demand of maize (*Zea mays*). To compensate for the poor nutrient bioavailability due to low root zone temperatures, farmers additionally apply nitrogen (N) and phosphorous (P) starters at planting, leading to nutrient balance surpluses and a thread to the environment.
In 2013 and 2014 series of field trials was established to test the possibility to replace starters by manure injection in placed bands close to the seedlings. Broadcast (BC) application with side dressed starter fertilizer (23-10 kg N-P ha^{-1}) was compared to injection treatments (with and without nitrification inhibitor) on seven sites.
Plant samples at V8 stage showed reduced growth for injection treatment, compared to broadcast treatment. However, relative to BC, injection with nitrification inhibitor led to equal early growth. At harvest, no differences in yield and quality were observed for BC and injection treatments, but injection treatments showed higher N uptake, being significant for nitrification inhibitor treatment (+7% in 2013 and +6% in 2014, respectively).
These results show increased N and P use efficiencies when manure is injected and therefore the possibility to reduce nutrient surpluses in maize growing. Thus, manure injection is beneficial for farmers and environment.